Happy Now, Tired Later? : Extraverted and Conscientious Behavior Are Related to Immediate Mood Gains, but to Later Fatigue

Leikas, Sointu

2017-10

Leikas , S & Ilmarinen , V-J 2017 , ' Happy Now, Tired Later? Extraverted and Conscientious Behavior Are Related to Immediate Mood Gains, but to Later Fatigue ' , Journal of Personality , vol. 85 , no. 5 , pp. 603-615 . https://doi.org/10.1111/jopy.12264

http://hdl.handle.net/10138/313256
https://doi.org/10.1111/jopy.12264

acceptedVersion

Happy now, tired later? Extraverted and Conscientious behavior are related to immediate mood gains, but to later fatigue

Sointu Leikas and Ville-Juhani Ilmarinen

Institute of Behavioural Sciences

University of Helsinki

Abstract

AIM. Experience-sampling studies on Big Five-related behavior show that people display the whole spectrum of each trait in their daily behavior, and that desirable Big Five states – especially state Extraversion – are related to positive mood. However, other research lines suggest that extraverted and conscientious behavior may be mentally depleting. The present research examined this possibility by extending the time frame of the measured personality processes. METHOD. A 12-day experience-sampling study (N = 48, No. of observations = 2328) measuring Big Five states, mood, stress, and fatigue five times a day. RESULTS: Extraverted and conscientious behavior were concurrently related to positive mood and lower fatigue, but to higher fatigue after a 3-hour delay. These relations were not moderated by personality traits. The relation between extraverted behavior and delayed fatigue was mediated by the number of people the person had encountered. Whether the person had a goal mediated the relation between conscientious behavior and delayed fatigue. CONCLUSION. Extraverted and conscientious behavior predict mental depletion after a 3-hour delay. The results help reconcile previous findings regarding the consequences of state extraversion, and provide novel information about the consequences of state conscientiousness.

Personality psychology has seen two major research trends during the last 15 years. One of these trends has provided accumulating empirical evidence that personality traits reliably predict behavior (Back, Schmukle, & Egloff, 2009; Borkenau, Mauer, Riemann, & Spinath, 2004; Cuperman & Ickes, 2009) and important life outcomes (Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). Meanwhile, another research trend has shown that individuals often – or even most of the time – act out of character (e.g. Fleeson, 2001; 2007; Fleeson & Gallagher, 2009). These apparently contradictory results can be reconciled – behaviors across many situations, or life outcomes that are likely to be the product of many choices and behaviors, are likely to be associated with personality traits. However, regarding any individual situation in the everyday life of a person, situational forces as well momentary feelings and other fleeting states are strong determinants of behavior, often to the extent that people act in ways not predicted by their personality traits (e.g. Fleeson, 2001; Fleeson & Gallagher, 2009).

Experience sampling (ESM) studies measuring personality states have shown that despite their stable trait standings, individuals display the whole spectrum of each personality trait in their everyday behavior (e.g. Fleeson, 2001; 2007). Such results have given rise to many novel and important questions regarding the interplay of personality, situations, and behavior, but research on this type of personality processes has hitherto been relatively scarce (e.g. Cervone, 2005; Fleeson, 2004; Fleeson & Law, in press). An important question in this domain concerns the consequences of everyday behavior. We now know that in their daily lives, everybody sometimes behaves, for instance, in a conscientious manner, and sometimes in a non-conscientious manner (e.g. Fleeson, 2001). But what are the consequences of such behaviors, both in general and in relation to stable personality traits? For example, is conscientious behavior – being responsible, organized, and productive –

more draining or stressful for non-conscientious individuals, or is it similarly draining for everyone, regardless of their level of trait Conscientiousness?

The consequences of trait-relevant behavior have received some research attention. Most notably, several studies have addressed the consequences of extraverted behavior for both Extraverts and Introverts (e.g. Fleeson, Malanos, & Achille, 2002; Zelenski, Santoro, & Whelan, 2012). However, such research has focused almost exclusively on behaviors related to the Extraversion-Introversion continuum and on mood, with the latter typically measured concurrently with or immediately after the occurrence of the behavior. Therefore, we know relatively little of (i) the consequences of behaviors related to other trait domains than Extraversion, (ii) consequences other than affective ones, and (iii) the delayed consequences of behavior. The main purpose of the present study is to examine both the immediate and delayed consequences of behaviors displaying extraversion and conscientiousness. The consequences of these behaviors on mood, stress, and mental depletion[1] are investigated, as well as possible trait-level moderators of such consequences. Furthermore, we look at situational mediators of such consequences.

The consequences of personality states in everyday life

ESM studies that have demonstrated the variability of behavior in everyday life have typically measured participants' behavior several times a day for a week or two, most often using Big Five –related items (e.g. *reliable* and *organized* for Conscientiousness) administered in state form (e.g., *please describe your behavior during the last hour*). Such studies have convincingly shown that our behavior is highly flexible and variable (e.g. Church, Katigbak, Ching, Zhang, et al., 2014; Fleeson, 2001; 2007, Heller, Komar, & Lee, 2007; Wilt, Noftle, Fleeson, & Spain, 2012). The results of these studies have been intuitively compelling: although everyone, on each personality dimension, can be described by a stable

standing around which their behavior mostly varies, people are able to adjust their behavior to the situational demands posed by a complex and changing world with varying goals, relationships, responsibilities, and cultural norms, to name just a few. However, we are only beginning to understand how the underlying behavioral processes unfold in everyday life.

Previous research has focused on the consequences of personality states in the context of extraverted behavior and mood. In a seminal study, Fleeson et al. (2002) showed that when people were experimentally instructed to behave in either an extraverted or introverted way, acting extraverted made them happier as compared to acting introverted. This result has since been replicated in several other studies and employing both experimental and ESM methodologies (e.g. McNiel, Lowman, & Fleeson, 2010; Wilt et al., 2012; Zelenski et al., 2012). Thus, there is mounting evidence for a causal relation between extraverted behavior and positive mood. This result is also theoretically plausible given the firmly documented robustness of the association between trait Extraversion and positive affect (e.g. Costa & McCrae, 1980; Lucas & Baird, 2004, Smillie, Cooper, Wilt, & Revelle, 2012). However, the result that introverts, when acting extraverted, become just as happy as extraverts (Fleeson et al., 2002) could be considered somewhat surprising.

Although extraverted behavior and positive mood are intimately, maybe even causally, connected, some literature suggests that extraverted behavior may also be mentally draining. For instance, there is evidence that a high workload (Repetti, 1989), negative interactions at work (Story & Repetti, 2006), and living in crowded circumstances (Evans & Lepore, 1993) lead to a preference for social withdrawal. The idea that extraverted behavior may be tiring is also widespread in popular media, as evidenced, for instance, by the enthusiastic reception of Susan Cain's book *Quiet: The hidden power of introverts in a world that can't stop talking* (2012). In this book, Cain suggests that, for Introverts, intensive

sociability is depleting and tiring, and this idea has become popular. But, to the best of our knowledge, this possibility has hitherto not been investigated empirically.

At first glance, the idea that extraverted behavior is depleting does not necessarily contradict results according to which extraverted behavior causes positive mood (e.g. Fleeson et al., 2002): it is quite possible to be tired and happy at the same time. Nevertheless, given that being active, energetic, and enthusiastic are integral components of Extraversion, it is highly likely that people do not feel tired when they are actually acting in an extraverted way, or immediately afterwards. Therefore, the possible depleting effects of extraverted behavior, in case they exist, may be evident only after a short delay, when the situation provoking extraverted behavior is over. However, no study that we know of has examined the delayed effects of extraverted behavior on mental depletion.

Aside from state extraversion, relatively little is known about the consequences of other personality states. In the present study, we are particularly interested in conscientious behavior. For most individuals, behaviors that can be characterized as more or less conscientious are likely to be an integral part of everyday life: work and other daily responsibilities require conscientious behavior. Regarding the consequences of trait and state Conscientiousness, these seem generally to be positive. Trait Conscientiousness, like trait Extraversion, is positively related to dispositional positive affect (e.g. DeNeve & Cooper, 1998), and negatively to dispositional negative affect (Fayard, Roberts, Robins, & Watson, 2012). Regarding state conscientiousness, most pertinent is a study that measured Big Five states and mood in five different cultures; the results of this study revealed that extraverted, emotionally stable, open, agreeable, and conscientious behavior (i.e., all desirable Big Five states) are concurrently related to positive mood in most cultures (Ching et al., 2014).

That conscientious behavior is concurrently correlated with positive mood (Ching et al., 2014) cannot be considered very surprising – acting in a conscientious way typically means fulfilling one's responsibilities and being productive, which is likely to evoke positive feelings. However, there are also several reasons to expect that conscientious behavior could be mentally depleting. First, people typically display high levels of conscientious behavior when working or studying. Working or studying conscientiously implies, for instance, that one is working in a productive, responsible, and industrious manner; that is, working hard and expending a lot of effort, which typically causes tiredness and depletion (e.g. van Hooff, Geurts, Beckers, & Kompier, 2011; Meijman & Mulder, 1998). Another line of research suggest that conscientious behavior may be depleting because it requires self-control. Exercising self-control has, in terms of willpower, been shown to cause a resource deficit (e.g. Baumeister, Vohs, & Tice, 2007; Hagger, Wood, Stiff, & Chatzisarantis, 2010) or a motivational/attentional deficit (Inzlicht & Schmeichel, 2012). Consequently, after the exercise of self-control, tasks that require more self-control are more difficult. Thus, as in the case of extraverted behavior, acting conscientious could be expected to make one happy but tired (it should be noted that although the failure of self-control referred to above is not reducible to the effects of fatigue alone, as shown by Vohs, Glass, Maddox, and Markman, 2011, such failures are typically accompanied by subjective fatigue; see Hagger et al., 2010).

The possible depleting effects of conscientious behavior are, as in the case of extraverted behavior, not likely to be evident immediately. This is because actually working towards a goal is likely to be related to lower fatigue – for instance, goal setting increases the energy and effort expended on an activity (e.g. Earley, Wojnarovski, & Prest, 1987). Furthermore, the literature on work engagement has shown that when people are highly engaged in their work, they experience feelings of enthusiasm and a high level of energy (e.g.

Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). Such feelings are likely to be related to low levels of experienced fatigue. Thus, as in the case of extraverted behavior, detecting a possible link between conscientious behavior and depletion requires the investigation of lagged effects; that is, within-individual processes need to be monitored over time.

Counter-trait behavior

An important question raised by research showing the flexibility of behavior is what are the consequences of acting against one's own personality? As discussed above, there is evidence suggesting that the connection between extraverted behavior and positive mood is likely to be equally strong among extraverts and introverts (e.g. Fleeson et al., 2002). More formally expressed, there is, in the domain of Extraversion, no state × trait interaction on mood, but only the positive main effect of state Extraversion. But what about other consequences? If extraverted behavior is indeed depleting or tiring, is it equally so for Extraverts and Introverts? And in the domain of Conscientiousness, is conscientious behave equally draining for everyone, or is it particularly draining for Non-Conscientious individuals? Although extraverted and conscientious behavior appear to have concurrent positive affective consequences for everyone (e.g. Ching et al., 2014; Fleeson et al., 2002), personality traits could be expected to affect the extent to which different behaviors are experienced as draining or depleting. Despite the high variability and flexibility of behavior, people do show stable patterns of behavior that are predicted by their trait standings (e.g. Borkenau et al., 2001; Fleeson & Gallagher, 2009). This implies, for instance, that extraverts are more used to being talkative, sociable, and assertive than introverts. Consequentially, extraverted behavior may be more habitual for extraverts than for introverts, making extraverted behavior more automatic and therefore less effortful for Extraverts, as compared to Introverts.

Besides habituation, another reason for the possible depleting effects of counter-trait behavior can be drawn from self-perception theory, which asserts that people sometimes make inferences about themselves on the basis of their own behavior (e.g. Bem & McConnell, 1970). Thus, for instance, a person low on trait Conscientiousness may notice that she or he is often late, less than optimally prepared, or dressed carelessly. Such observations may lead the person to conclude that it is difficult for her or him to behave in a conscientious way. Such observations may lead to experienced fatigue following conscientious behavior. Hence, although desirable Big Five –related behaviors seem to have certain positive consequences (i.e. more positive mood) for everyone (e.g. Ching et al., 2012), it is possible that such behaviors are more difficult and thus depleting among individuals for whom such behaviors are less typical; i.e., among individuals with less desirable personality traits.

Mediators between personality states and their correlates

The main goal of the present study is to provide an overview of the immediate and delayed consequences of behavior, conceptualized as the expression of Big Five states, especially in terms of mental depletion. Furthermore, we investigated situational features that could mediate such consequences. Research on the situational contingencies of the Big Five states (Fleeson, 2007) has so far revealed that Big Five –relevant behaviors are often enacted in predictable situations. For instance, people typically engage in more conscientious and less agreeable behavior in task-oriented situations, and more extraverted and agreeable behavior in friendly situations (Fleeson, 2007).

To date, very few studies have examined the delayed consequences of the Big Five states, and no study that we know of has examined situational features as potential mediators between Big Five states and their later consequences. However, this type of

research could offer important insights into the dynamics between personality, situation, and behavior (Funder, 2006). We therefore ran, and report on, explorative mediation analysis in which we sought to establish situational mediators of the consequences of behavior.

The present study

In the present experience-sampling study, the ongoing dynamics between Big Five traits, Big Five states, mood, stress, fatigue, and day-level experiences are investigated. Regarding stress, although, as argued above, fatigue may be the most likely undesirable consequence of extraverted or conscientious behavior, such behaviors may also be accompanied by stress, especially if these behaviors are less typical for the individual. Investigating the effects of personality states on both fatigue and stress should provide a more comprehensive picture of the consequences of behavior on feelings and thereby help interpreting the results. For example, being tired and happy is a different kind of state than being tired and stressed. Extraverted and conscientious behavior are expected to be concurrently correlated with more positive mood and lower fatigue. By contrast, when looking at lagged relations, such behaviors are, based on the above arguments, expected to be associated with fatigue. We also explore possible situational mediators of the consequences of behavior.

Method

Participants. Participants were 48 students (41 women) from Finnish universities. They were recruited via an e-mail invitation that was sent to several student mailing lists. The e-mail asked students who owned a smart phone with an internet connection to participate in a study on "the variability and stability of daily behavior". As compensation, participants received a 10 € (11.2 US $) gift card for a major department store, as well as a summary profile of their daily behavior. Participants were, on average, 24.6 years old (age range: 18-41 years, *SD* = 4.90 years), and all were ethnically Caucasian.

Procedure. The experience sampling procedure consisted of five reports per day for 12 consecutive days. Participants responded online via their own smart phones. Links to the questionnaires were sent in text messages to the personal phone numbers that the participants provided. The text messages were sent simultaneously to all participants each day at 9:30 am, 12:30 pm, 3:30 pm, 6:00 pm, and 9:00 pm. In the ESM questionnaires, participants were asked to describe their behavior, feelings, and situations "during the last hour". Participants were asked to respond within 70 minutes, with the exception of the last questionnaire of the day, which participants were to respond to within 120 minutes (this was done to ensure as many end-of-day reports as possible). After these time intervals the questionnaire was closed and participants could no longer provide that particular report. Once participants had completed the 12-day ESM procedure, participants were via e-mail asked to complete online a Big Five trait measure and respond to some demographic questions.

Measures

Big Five traits. Personality traits were measured using the 60-item Revised NEO-FFI (Costa & McCrae, 1992). The response format was a five-point Likert scale ranging from *totally disagree* (1) to *totally agree* (5). Reliabilities (Cronbach's alphas) were .77 (Extraversion), .90 (Emotional Stability), .73 (Openness), .81 (Agreeableness) and .87 (Conscientiousness).

Big Five states. Each Big Five state was measured with two adjectives per ESM report. To ensure comparability, the same items were employed across all measurement points (however, the order of the items was varied between questionnaires). Participants were asked to rate on a seven-point scale how well each item described their behavior during the last hour (1 = *not at all*; 7 = *very much*).

The ten items were created to reflect the most central content of each Big Five trait whilst being applicable to everyday life. The Extraversion items were *talkative* and

sociable, the Emotional stability items were *relaxed* and *insecure* (reversed), the Agreeableness items were *kind* and *compassionate*, the Openness items were *imaginative* and *creative*, and the Conscientiousness items were *productive* and *responsible*.

Situation characteristics. In each ESM report, participants were asked to describe the situation(s) that they had been in during the last hour in terms of 5 situation characteristics. More specifically, they were asked to report to what extent they had *studied*, *worked*, *interacted in person with others*, and *had a goal that they tried to accomplish*. The response format was a five-point Likert scale ranging from *not at all* (1) to *very much* (5). In addition, they reported how many people they had met during the last hour (1 = *none; I was alone*; 2 = *one person*; 3 = *two people*; 4 = *three people*; 5 = *four people*; 6 = *5 or more people*). Based on the observed frequencies, this variable was recoded into a three-class variable (alone; with one person; with 2 or more people).

State affect. In each ESM report, participants responded to single-item measures assessing current mood, stress, and fatigue. *Mood* was measured by asking participants to rate their mood at the moment on a seven-point scale ranging from *very bad* (1) to *very good* (7). *Stress* was measured by asking participants how stressed they were at the moment on a seven-point scale ranging from *not at all* (1) to *extremely stressed* (7)., and *fatigue* was measured by asking participants to report how tired they were at the moment on a seven-point scale ranging from *not at all* (1) to *extremely tired* (7).

Results

The data was initially scanned for missing values. The response rate was good: 80.8 % of all possible reports were received. In total 542 (18.8 %) reports were missing, and 10 (0.03 %) reports were partially missing. Four participants out of 48 missed more than 50 % of the reports, and one participant missed 70 % of the reports. However, even these participants

returned at least 17 reports, which is enough for the two-level multilevel modeling analyses that we employed. Thus, all participants and all available data was utilized.

In our first analysis, the between- and within-person variance components were calculated for the ESM variables. The results, presented in Table 1, showed that for almost all variables, within-person variability was considerably larger than between-person variability – a pattern typically found in personality-related ESM research (e.g. Fleeson, 2001).

Correlations between the Big Five traits and average states were also computed before the main analyses. Only the correlations for Emotional stability (r = .29, p = .05) and Openness (r = .43, p = .003) were significant. The correlations for Agreeableness (r = .24, p = .11) and Conscientiousness (r = .21, p = .17) were positive but non-significant, and the correlation for Extraversion was essentially null (r = .08, p = .60). Trait-state correlations obtained in previous studies have typically hovered around .30 (Fleeson, 2001; Heller et al., 2007) – with the exception of Extraversion, the correlations we report were in line with previous studies.

Concurrent and delayed effects of the Big Five states on mood, stress, and fatigue: moment-to-moment analyses

Our main research questions concerned the relations between daily behavior, mood, fatigue, and stress. All analyses were conducted with the lme4 package (Bates, Maechler, Bolker, & Walker, 2015) within the R environment (version 3.1.3; R Core Team, 2015). All independent variables were person-mean centered prior to the main analyses. Likelihood ratio testing (LRT) was used to test the significance of the fixed effects.

To examine the concurrent and lagged relations between Big Five states and mood, stress, and fatigue, we ran linear mixed model regressions predicting mood, stress, and fatigue (each in turn) at time T2 from person-centered, momentary Big Five behaviors at T1.

Four models were tested for each dependent variable. Model 1 only included the intercept and served as a baseline model. In Model 2, T2 mood (or stress or fatigue) was regressed on T1 mood and T1 Big Five states. In Model 3, T2 Big Five states were added as predictors to control for the concurrent effects of behavior, and in Model 4, Big Five personality traits were added as predictors. In sum, in Model 4, mood (or stress or fatigue) at T2 was predicted by T1 Big Five states and T1 mood (or stress or fatigue), and T2 Big Five states and Big Five traits were controlled for. For the lagged effect to be considered statistically meaningful, we required it to be statistically significant regardless of whether concurrent effects were included in the model (this requirement was due to the collinearity pattern caused by the autocorrelations of T1 and T2 variables). The results are shown in Tables 2 (mood), 3 (stress), and 4 (fatigue).

As shown in Table 2, previous mood (i.e., 3-4 hours earlier) predicted later mood (the autoregressive effect). Although the lagged effects of state Extraversion, Emotional Stability and Openness were significant in the model with concurrent predictors (Model 3), these effects were non-significant in the absence of the concurrent predictors (Model 2). Thus, the lagged effects seemed to be due to collinearity between the independent variables, and were not interpreted as meaningful. Moreover, none of the lagged effects showed significant between-subjects variance (all *p*s > .16). The result further showed that all Big Five states were concurrently correlated with mood: behaving in a more extraverted, emotionally stable, agreeable, open (marginally), and conscientious way was associated with more positive mood. Regarding traits (Model 4), only trait Emotional Stability was related to mood: Emotionally Stable individuals were generally in a more positive mood.

Table 3 shows the results for stress. Previous stress predicted later stress (the autoregressive effect). In the absence of concurrent Big Five states, there were no lagged effects of the Big Five states on stress (Model 2). Regarding concurrent effects, those

behaving in more extraverted or emotionally stable way experienced less stress. None of the lagged effects showed significant between-subjects variance (all *p*s > .23). In addition, trait Emotional Stability explained individual differences in average stress-levels: more emotionally stable individuals were on average less stressed.

Table 4 shows that in the prediction of fatigue, our main hypotheses were supported: both extraverted (estimate = .08, *SE* = .03, $p < .001$) and conscientious (estimate = .12, *SE* = .02, $p < .001$) behavior positively predicted later fatigue (Models 2 to 4). Furthermore, these same behaviors were concurrently negatively related to fatigue. Emotionally stable behavior was negatively related to fatigue both concurrently and after a delay, whereas open and conscientious behavior had negative concurrent relations with fatigue. Regarding traits, only Emotional Stability had a significant effect: Emotionally stable participants were, on average, less tired across situations.

Counter-trait behavior

In our analyses regarding the possible consequences of counter-trait behavior, we first examined, one slope at a time and employing LRT, whether there was significant between-person variation in the slopes of the above reported lagged effects. Significant slope variation was found only for the relation between lagged conscientious behavior and fatigue (σ_{u1} = 0.10). However, this variation could not be explained by trait Conscientiousness (the cross-level interaction between conscientious behavior and trait Conscientiousness was not statistically significant ($p = .88$)).

As an additional test of the expected moderator effects, we regressed, separately for each participant, T2 fatigue on T1 extraverted behavior. The participant-specific beta coefficients (ranging from -.14 to .54 with an average of .06) were retrieved from these analyses and correlated with trait Extraversion. The correlation was .08 ($p = .598$), implying

that the relation between extraverted behavior and later fatigue was independent of level of trait Extraversion. Similar analyses in which T2 fatigue was regressed on T1 conscientious behaviors provided betas ranging from -.42 to .62 with an average of .05. The correlation between beta and trait Conscientiousness was -.21 (p = .16). Although the correlation was not statistically significant, there was a trend towards significance; we return to this issue in the Discussion.

Situational mediators of personality state – fatigue relations

Regarding mediation, we first explored two possible mediators of the state Extraversion-fatigue relation: the number of people met during the last hour, and the intensity of social interaction. Because all variables relevant for the mediation were level 1 variables, we employed the multilevel mediation approach "1-1-1" (Zhang, Zyphur, & Preacher, 2009). The number of people met was tested first. Although the nature of this variable is ordinal and its distribution is non-normal, alternative analyses taking these attributes into account (e.g. estimating the a-path – the correlation between Extraversion and the number of people met – by means of a logit link mixed model (Christensen, 2015) and using this estimate for computing $Z_{Mediation}$ (Iaobucci, 2012)) showed virtually identical results to those presented below and in Table 5 (first row).

To derive the b and c' paths, the number of people that the person had met at T1 was entered into the model predicting fatigue. The average number of people met computed across all measurement occasions was controlled for. The number of people met at T1 was associated with fatigue three hours later at T2 (the b-path estimate was 0.12 (SE = .04, p < .01)). Furthermore, adding the number of people met at T1 into the model rendered the relation between T1 state Extraversion and later fatigue marginally significant (the c'-path estimate was now 0.05, SE = .03, p = .06). In addition, T1 Extraverted behavior was

significantly associated with number of people met at T1 (when controlling for other behaviors, the a-path estimate was 0.25, *SE* = .01, $p < .001$). Sobel's test of the indirect effect was also significant (a*b: 0.03, *SE* = .01, $p < .01$) indicating that the number of people met at T1 mediated the association between T1 extraverted behavior and T2 fatigue. The number of people met explained 36 % of the lagged association between extraversion and fatigue (based on the ratio c'/c; that is 0.051/0.080.

Similar mediation analyses as those described above were run for intensity of social interaction; that is, participants' ratings on the scale assessing the extent to which they had interacted in person with others. The results showed that the intensity of social interaction at T1 marginally statistically significantly predicted fatigue at T2 (the b-path estimate was = .05, *SE* = .03, $p = .08$) and was statistically significantly associated with T1 extraverted behavior (the a-path estimate was .14, *SE* = .01, $p < .001$). Adding T1 intensity to the model predicting fatigue rendered the path from T1 extraverted behavior to T2 fatigue non-significant (the c'-path estimate was .05 (*SE* = .03, $p = .11$). However, the intensity of social interaction could not add to the predictive power of the above-described model that included the number of people met at T1. In a model that included T1 extraverted behavior, T1 intensity, and T1 number of people met as predictors of T2 fatigue, only T1 number of people met was a statistically significant predictor (estimate = .12, *SE* = .05, $p = .01$); whereas intensity no longer predicted later fatigue (estimate = .01, *SE* = .03, $p = .72$).

Working, studying, and having a goal were tested as possible mediators of the association between conscientious behavior and later fatigue. Working or studying at T1 could be ruled out as potential mediators as these variables did not predict T2 fatigue (the estimates were .05 (*SE* = .03, $p = .13$) and .03 (*SE* = .02, $p = .20$), respectively). However, as also shown in Table 5 (second row), having a goal at T1 did predict T2 fatigue (the b-path estimate was .07, *SE* = .03, $p = .03$). Furthermore, conscientious behavior at T1 was

associated with having a goal at T1 (the a-path was .62 (*SE* = .02, $p < .001$) and the path from T1 conscientious behavior to T2 fatigue (the c-path estimate was .13 (*SE* = .02, $p < .001$) grew weaker when having a goal at T1 was added to the model (the c'-path estimate = .09, *SE* = .03, $p < .01$). Sobel's test confirmed the occurrence of partial mediation (z = 2.16, *SE* = .03, $p = .03$); that is, conscientious behavior caused later fatigue in part because this behavior was associated with having a goal.

Discussion

The finding that behavior is highly variable in the course of daily life (e.g. Fleeson, 2001) has called for more research on the ongoing dynamics between behavioral and affective processes (Fleeson, 2004; Heller et al., 2007). Previous research has shown that extraverted and conscientious behavior have immediate affective benefits (e.g. Ching et al., 2014; Fleeson et al., 2002, Zelenski et al., 2012). The present study expanded the time perspective of the research of these behavioral processes and showed that along with concurrent affective gains, extraverted and conscientious behavior also predict short-term mental depletion. These results are important because they add to our knowledge of the effects of behavioral states and of personality processes, and help reconcile some previous, ostensibly conflicting findings regarding extraverted behavior.

The consequences of extraverted and conscientious behavior

The present results showed that extraverted behavior was concurrently related to positive mood and lower fatigue, but also to being more tired about 3 hours later. This lagged effect on fatigue did not vanish when controlling for concurrent extraversion and fatigue. Thus, it seems that the same extraverted behavior can make one both happy and tired – but within different time windows.

Extraverted behavior has been shown to have mainly desirable consequences: It is, e.g., related to higher positive affect (i) concurrently (e.g. Wilt et al., 2012), (ii) after a short delay (Lischetzke et al., 2012), and (iii) on a weekly level (Fleeson et al., 2002, Study 2). Experimental research has even established causality – extraverted behavior causes positive mood (Fleeson et al., 2002; Zelenski et al., 2012). Regarding more objectively assessed outcomes, longitudinal studies have shown that an active social life predicts longevity and good health (e.g. Berkman, Vaccarino, & Seeman, 1993; Rizzuto, Orsini, Qiu, Wang, & Fratiglioni, 2012). Thus, extraverted behavior, because it leads to happiness and better health, could be concluded to be desirable. However, this does not seem to be the whole story: When under stress, tired, or living in crowded circumstances, people often choose to be alone, if possible (e.g. Evans & Lepore, 1993; Repetti, 1989), suggesting that socializing requires effort and can be depleting. The present results offer a way to integrate the above perspectives on the consequences of extraverted behavior by showing that in the course of daily life, extraverted behavior has the potential to make one happy and energetic in the short run but tired in the long run.

The present results are, to our knowledge, the first to provide direct empirical evidence that extraverted behavior may be mentally depleting. This does not occur at the moment one is acting extraverted, but a short while afterwards. Conscientious behavior showed a similar pattern: Conscientious behavior was concurrently related to higher positive mood and lower fatigue, but to higher fatigue after about 3 hours. This result could be seen as more intuitively plausible than the above-described result according to which extraverted behavior causes later fatigue. Conscientious behavior typically means acting in a productive, goal-directed, responsible, and organized way. To take a specific example, it could mean working or studying effectively. Such behavior is (physically or mentally) effortful and requires self-control; people could thus be expected to feel more tired after behaving

conscientiously. Furthermore, our results according to which people feel concurrently less tired when engaged in conscientious behavior are broadly in line with research on work engagement – the literature in this field suggests that people tend to be energized and enthusiastic when they are engaged in their work (e.g. Schaufeli et al., 2002).

Overall, the present results are in line with previous research (e.g. Church et al., 2014; Wilt et al., 2012) in demonstrating that despite their short-term depleting effects, extraverted and conscientious behavior seem to have mainly positive consequences, such as more positive mood. Given that there is plenty of trait research that points towards the benefits of being extraverted (e.g. Costa & McCrae, 1980; Larsen & Ketelaar, 1991) and conscientious (e.g. Fayard et al., 2012; Roberts et al., 2007), it seems likely that the fatigue following such behavior is a prize worth paying. However, for those who do feel depleted after social interaction or after working hard, it may be pleasant to learn that such a reaction is quite normal (and does not imply that one is an introvert or that one is lazy).

Counter-trait behavior

Overall, and in contrast to what could have been expected, our results did not suggest that counter-trait behavior would be particularly depleting. Although this contradicts the view that sociability is especially depleting for introverts (Cain, 2012) – a view that has attracted plenty of media attention – it is in line with previous research. The majority of the results on extraverted behavior and mood have consistently shown that the affective consequences of extraverted behavior are no different for introverts than for extraverts (e.g. Fleeson et al., 2002; Wilt et al., 2012).

As noted in the Introduction, the absence of state × trait interactions in predicting mood or fatigue could be considered somewhat surprising: Why are the behavioral consequences of state extraversion identical regardless of level of trait Extraversion? As is

customary in this type of research, we person-centered the Big Five states, which opens up the possibility of a methodological explanation. That is, trait Extraverts and trait Introverts could employ different reference points when rating their behavior. For example, trait introverts could rate their behavior as highly extraverted after merely talking with some friends, whereas trait extraverts could need to engage in a much more socially demanding task, such as hosting a party, in order to provide a similar rating of their behavior. This means that introverts could, in fact, become fatigued by much lower levels of extraverted behavior. To investigate this possibility in the current data, we reran the analyses in which we predicted lagged fatigue with extraverted behavior using grand-mean centered variables – the results were virtually identical to those reported on in the Results section. In addition, we conducted a median split for trait Extraversion[3]. Then the raw (non-centered) behavior ratings were used to assess whether trait Introverts reported higher levels of extraverted behavior than trait Extraverts in situations in which they interacted with two or more people (i.e., in a situation that could be objectively deemed as quite social), but they did not (M = 4.50 for introverts; M = 4.72 for extraverts). Thus, we suspect that the methodological explanation is not sufficient.

Fleeson et al. (2002) offered state-trait isomorphism as an explanation of why the consequences of extraverted behavior on mood are identical for trait introverts and extraverts. In this view, states are functionally similar – have similar correlates and consequences – to their corresponding traits (Fleeson et al., 2002). There is some evidence for state-trait isomorphism regarding extraversion and mood (Wilt et al. 2012), and if such isomorphism existed also for extraversion and fatigue, there would be no reason to expect trait Extraversion to moderate the impact of extraverted behavior on fatigue. Rather, fatigue would be caused by extraverted behavior, which in turn would be determined in part by trait Extraversion. Yet another explanation could be that Introverts do become more tired, but only when the exhibited level of extraverted behavior is very high and/or related to approach

goals. This explanation would be consistent with the results of Smillie et al. (2012), who found that Extraverts, as compared to Introverts, showed greater affective reactivity to desirable stimuli, but only when the stimuli were extremely appetitive. However, situations that require extreme levels of approach-related behavior may rarely be encountered in daily life. Clearly, this is an interesting topic for future research.

Similarly to Extraversion, trait Conscientiousness did not moderate the impact of conscientious behavior on fatigue. Conscientious behavior could have been expected to be less effortful for highly conscientious individuals. One reason that we did not detect such an effect could simply be that our sample size was not ideal for detecting interactions (as discussed further in Limitations). In a larger sample, the non-significant trend suggesting that less conscientious individuals are more fatigued after conscientious behavior could have reached conventional levels of statistical significance. Therefore, our results cannot rule out the possible existence of such a theoretically plausible interaction effect.

Situational features as mediators of behavior-fatigue link

The link between extraverted behavior and lagged fatigue was mediated by the number of people met. This novel result is consistent with research showing that a large number of "forced" social contacts (e.g. living in a crowded home or a crowded neighborhood) is related to higher social withdrawal and lower social activity outside of these contacts (Valins & Baum, 1973; Evans & Lepore, 1993; McCarthy & Saegert, 1978). Thus, in light of the current results and some such previous results, it seems plausible that extraverted behavior in uncontrolled interactions with a large number of others would generally lead to mental depletion – note, however, that a large number of contacts is more likely to include also unwanted contacts, which could thus be the variable doing the causal work. By contrast,

interacting with one close friend may not be depleting, even when the level of extraverted behavior is high.

The above described mediation results raise the question of whether people actually need solitude to recover from the depleting effects of extraverted behavior (as indirectly suggested by the results of Repetti, 1989), or would spending time with, for instance, a few close others be just as replenishing. Previous research indicating that social interactions may be draining suggests that interactions leading to social withdrawal are typically unwanted or uncontrollable (e.g. McCarthy & Saegert, 1978), and our results further suggest that the number of contacts is of crucial importance in the link between extraverted behavior and fatigue. As we did not measure the number of unwanted contacts, which, as noted above, is likely to increase when the number of contacts in general increases, we cannot rule out the possibility that it is only unwanted contacts that are tiring, and that spending time with others of one's own choosing might be just as effective as solitude in recovering from mental depletion.

The link between conscientious behavior and lagged fatigue was partly mediated by having a goal. This result cannot be considered very surprising – goal-directed activity means suppressing immediate desires and focusing on long-term achievements, and this is known to be mentally depleting (e.g. Baumeister et al., 2007). By contrast, working and studying did not serve as mediators – although these activities are perhaps generally seen as tiring, it may often be possible to engage in them whilst only expending minimal effort. By contrast, working towards a goal could be a more direct indicator of effortful activity.

Limitations

The most important limitation of the present study was the small sample size (48 individuals). Although not an issue for the within-person analyses (we had a lot of observations per

participant), our sample size was less than ideal for testing between-person or interaction effects. Interaction effects between trait and states variables could have gone undetected due to lack of power.

Another limitation was that the sample was almost all female (41 of the 48 participants were female). There is no *a priori* reason to assume that the type of within-person processes that we investigated would be different for men and women, but neither can this possibility be ruled out; these processes should in future studies be investigated in more representative samples. The mediation result for extraverted behavior that we report on could be affected by the biased gender distribution. That is, when it comes to friendship, women often favor dyadic relationships, whereas men favor larger groups (e.g. David-Barret, Rotkirch, Carney, Izquierdo, Krems, Townley, McDaniell, Byrne-Smith, & Dunbar, 2015). Thus, it seems possible that the tiring effect of meeting many people is specific to women.

As suggested in the above discussion, a possible reason for the depleting effects of conscientious behavior could be that conscientious behavior often involves the use of self-control, which is tiring (e.g. Baumeister et al., 2007). However, our ESM procedure did not include a direct measure of state self-control (state conscientiousness was measured with the items *productive* and *responsible*). Thus, based on our results, it is unclear whether the use of self-control is the main reason, or even one of the main reasons, for the tiring effects of conscientious behavior. This could be an interesting question for future research.

Conclusion

The findings of the present study a) provide novel information on personality processes over time; b) offer a way to reconcile previous findings regarding the beneficial and adverse effects of extraverted behavior in everyday life; c) present new empirical evidence on the

topic of social interaction and mental depletion; and d) specify some situational conditions that link extraverted and conscientious behavior to later fatigue.

Personality processes have long remained as an understudied topic, although knowledge of these processes is necessary for a more complete understanding of behavior (e.g. Cervone, 2005). The development of ESM along with results showing the high variability of behavior (Fleeson, 2001; Fleeson & Gallagher, 2009) has prompted research on such processes. Heller et al. (2007) noted that identifying the antecedents of within-person behavioral variability is important for the purposes of demonstrating that such variability represents meaningful variance rather than error. The present study took another, equally important perspective by studying the consequences of within-person variability in personality, thereby providing evidence of the meaningfulness of personality states from the other side of the behavioral process. However, much more research on these processes is needed. Important topics for future research in the field of personality processes include state × trait interactions, longer and more complex within-person processes, and the situational features interacting with such processes.

Footnotes

1. In our use of the term ‘fatigue’, we follow the broad definition of Brown and Schutte (2006), who defined fatigue as “a pervasive sense of tiredness or lack of energy that is not related exclusively on exertion” (p. 585). In line with this, we use the terms ‘fatigue’, ‘mental depletion’, and ‘tiredness’ interchangeably, depending on which literature we address.
2. In addition to analyzing the lagged effects of the previous Big Five state (lag 1) on fatigue, we also tested models that included lagged effects that preceded the dependent measures by two time points (lag 2; we thank an anonymous reviewer for this suggestion). These lag 2 effects were tested alongside concurrent and lag 1 behaviors. The lag 2 effects of extraverted (estimate = .02, *SE* = .03, *p* = .64) and conscientious (estimate = .01, *SE* = .03, *p* = .44) behavior on fatigue were non-significant, but the lag 2 effect of emotionally stable behavior on fatigue was significant and negative (estimate = -.08, *SE* = .03, *p* = .02) similarly to concurrent and lag 1 effects. The concurrent and lag 1 effects reported on in Table 4 were unaffected by the inclusion of these lag 2 effects.
3. We acknowledge that median split on a trait measure is not an optimal way to categorize individuals as Extraverts and Introverts. However, because of the small sample size, we decided to use the median split for this additional analyses rather than selecting even smaller portions of participants to the analysis. However, it remains possible that comparing individuals from the high and low ends of the Extraversion continuum could have revealed a different pattern.

Declaration of conflicting interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Preparation of this manuscript was supported by Grant 266076 from the Academy of Finland and a Grant from the Jenny and Antti Wihuri foundation.

References

Back, M. D., Schmukle, S. C., & Egloff, B. (2009). Predicting actual behavior from the explicit and implicit self-concept of personality. *Journal of Personality and Social Psychology, 97*, 533-548.

Bates, D., Maechler, M., Bolker, B. & Walker, S. (2015). _lme4: Linear mixed-effects models using Eigen and S4_. R package version 1.1-9, URL: https://CRAN.R-project.org/package=lme4.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*, 351-355.

Berkman, L. F., Vaccarino, V., & Seeman, T. (1993). Gender differences in cardiovascular morbidity and mortality: The contribution of social networks and support. *Annals of Behavioral Medicine, 15*, 112-118.

Borkenau, P., Riemann, R., Angleitner, A., & Spinath, F. M. (2001). Genetic and environmental influences on observed personality: Evidence from the german observational study of adult twins. *Journal of Personality and Social Psychology, 80*, 655-668.

Brown, R. F., & Schutte, N. S. (2006). Direct and indirect relationships between emotional intelligence and subjective fatigue in university students. *Journal of Psychosomatic Research, 60*, 585-593.

Cain, S. (2012). *Quiet: The power of introverts in a world that can't stop talking*. New York: Random House.

Cervone, D. (2005). Personality architecture: Within-person structures and processes. *Annual Review of Psychology, 56*, 423-452.

Ching, C. M., Church, A. T., Katigbak, M. S., Reyes, J. A. S., Tanaka-Matsumi, J., Takaoka, S., Zhang, H., Shen, J., Arias, R., Rincon, B., & Ortiz, F. A. (2014). The

manifestation of traits in everyday behavior and affect: A five-culture study. *Journal of Research in Personality, 48,* 1-16.

Christensen, R. H. B. (2015). A Tutorial on fitting Cumulative Link Mixed Models with clmm2 from the ordinal Package.

Colvin, C. R. (1993). "Judgable" people: Personality, behavior, and competing explanations. *Journal of Personality and Social Psychology, 64,* 861-873.

Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology, 38,* 668-678.

Costa, P. T. & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual*. Psychological Assessment Resources, Odessa, FL.

Cuperman, R., & Ickes, W. (2009). Big five predictors of behavior and perceptions in initial dyadic interactions: Personality similarity helps extraverts and introverts, but hurts "disagreeables". *Journal of Personality and Social Psychology, 97*, 667-684.

David-Barret, T., Rotkirch, A., Carney, J., Izquierdo, I. B., Krems, J. A., Townley, D., McDaniell, E., Byrne-Smith, A., & Dunbar, R. I. M. (2015). Women favour dyadic relationships, but men prefer clubs: Cross-cultural evidence from social networking. *PLoS ONE*, 10: e0118329. doi:10.1371/journal.pone.0118329

DeNeve, K. M., & Cooper, H. (1998). The happy personality: A meta-analysis of 137 personality traits and subjective well-being. *Psychological Bulletin, 124*, 197-229.

Earley, P. C., Wojnaroski, P., & Prest, W. (1987). Task planning and energy expended:

Exploration of how goals influence performance. *Journal of Applied Psychology, 72*, 107-114.

Evans, G. W., & Lepore, S. J. (1993). Household crowding and social support: A quasiexperimental analysis. *Journal of Personality and Social Psychology, 65*, 308-316.

Fayard, J. V., Roberts, B. W., Robins, R. W., & Watson, D. (2012). Uncovering the affective core of conscientiousness: The role of self-conscious emotions. *Journal of Personality, 80*, 1-32.

Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality and Social Psychology, 80*, 1011-1027.

Fleeson, W. (2004). Moving personality beyond the person-situation debate: The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science, 13*(2), 83-87.

Fleeson, W. (2007). Situation-based contingencies underlying trait-content manifestation in behavior. *Journal of Personality, 75*, 825-862.

Fleeson, W., & Gallagher, P. (2009). The implications of big five standing for the distribution of trait manifestation in behavior: Fifteen experience-sampling studies and a meta-analysis. *Journal of Personality and Social Psychology, 97*, 1097-1114.

Fleeson, W. & Law, M. K. (in press). Trait enactments as density distributions: The role of actors, situations, and observers in explaining stability and variability. *Journal of Personality and Social Psychology*.

Fleeson, W., Malanos, A. B., & Achille, N. M. (2002). An intraindividual process approach

to the relationship between extraversion and positive affect: Is acting extraverted as "good" as being extraverted? *Journal of Personality and Social Psychology, 83*, 1409-1422.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin, 136*, 495-525.

Heller, D., Komar, J., & Lee, W. B. (2007). The dynamics of personality states, goals, and well-being. *Personality and Social Psychology Bulletin, 33*, 898-910.

van Hooff, Madelon L. M., Geurts, S. A. E., Beckers, D. G. J., & Kompier, M. A. J. (2011). Daily recovery from work: The role of activities, effort and pleasure. *Work & Stress, 25*, 55-74.

Iacobucci, D. (2012). Mediation analysis and categorical variables: The final frontier. *Journal of Consumer Psychology, 22*, 582-594.

Inzlicht, M., & Schmeichel, B. J. (2012). What is ego depletion? toward a mechanistic revision of the resource model of self-control. *Perspectives on Psychological Science, 7*, 450-463.

Judge, T. A., Higgins, C. A., Thoresen, C. J., & Barrick, M. R. (1999). The Big Five personality traits, general mental ability, and career success across the life span. *Personnel Psychology, 52*, 621-652.

Larsen, R. J., & Ketelaar, T. (1991). Personality and susceptibility to positive and negative emotional states. *Journal of Personality and Social Psychology, 61*, 132-140.

Lischetzke, T., Pfeifer, H., Crayen, C., & Eid, M. (2012). Motivation to regulate mood as a mediator between state extraversion and pleasant–unpleasant mood. *Journal of Research in Personality, 46*, 414-422.

Lucas, R. E., & Baird, B. M. (2004). Extraversion and emotional reactivity. *Journal of*

Personality and Social Psychology, 86, 473-485.

McCarthy, D., & Saegert, S. (1978). Residential density, social overload, and social withdrawal. *Human Ecology, 6*, 253-272.

McNiel, J. M., Lowman, J. C., & Fleeson, W. (2010). The effect of state extraversion on four types of affect. *European Journal of Personality, 24*, 18-35.

Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In P. J. D. Drenth & H. Thierry (Eds.), *Handbook of work and organizational psychology: Vol. 2. Work psychology* (pp. 5–33). Hove, UK: Psychology Press.

Ozer, D. J., & Benet-Martínez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology, 57*, 401-421.

R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL: http://www.R-project.org.

Repetti, R. L. (1989). Effects of daily workload on subsequent behavior during marital interaction: The roles of social withdrawal and spouse support. *Journal of Personality and Social Psychology, 57*, 651-659.

Rizzuto, D., Orsini, N., Qiu, C., Wang, H., & Fratiglioni, L. (2012). Lifestyle, social factors, and survival after age 75: Population based study. *BMJ: British Medical Journal, 345*, 1-10.

Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science, 2*, 313-345.

Schaufeli, W. B., Salanova, M., González-romá, V., & Bakker, A. B. (2002). The

measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3,* 71-92.

Smillie, L. D., Cooper, A. J., Wilt, J., & Revelle, W. (2012). Do extraverts get more bang for the buck? refining the affective-reactivity hypothesis of extraversion. *Journal of Personality and Social Psychology, 103,* 306-326.

Story, L. B., & Repetti, R. (2006). Daily occupational stressors and marital behavior. *Journal of Family Psychology, 20,* 690-700.

Valins, S., & Baum, A. (1973). Residential group size, social interaction, and crowding. *Environment and Behavior, 5,* 421-439.

Vohs, K. D., Glass, B. D., Maddox, W. T., & Markman, A. B. (2011). Ego depletion is not just fatigue: Evidence from a total sleep deprivation experiment. *Social Psychological and Personality Science, 2*(2), 166-173.

Wilt, J., Noftle, E. E., Fleeson, W., & Spain, J. S. (2012). The dynamic role of personality states in mediating the relationship between extraversion and positive affect. *Journal of Personality, 80,* 1205-1236.

Zelenski, J. M., Santoro, M. S., & Whelan, D. C. (2012). Would introverts be better off if they acted more like extraverts? Exploring emotional and cognitive consequences of counterdispositional behavior. *Emotion, 12,* 290-303.

Zhang, Z., Zyphur, M. J., & Preacher, K. J. (2009). Testing multilevel mediation using hierarchical linear models problems and solutions. *Organizational Research Methods, 12,* 6.